

## **Introduction to Geographic Information Systems (GIS)**

**Prerequisites:** Basic understanding and experience with Windows-based software applications is recommended.

**Hours/Module:** 4 (concept, hands-on learning, exercise completion and final project work blocks)

### **Course Description:**

This 13-module course will provide students with a comprehensive understanding of Geographic Information Systems (GIS) and their applications. Students will learn about the essential components and functionalities of GIS, including ArcGIS software, data types, and map creation. The course covers various topics such as symbolizing features, classifying features, labeling, cartography elements, coordinate systems, map projections, data analysis, geodatabases, querying data, and geoprocessing tools. Additionally, students will explore project management basics and integration with GPS/GPR, data sourcing, and considerations for presenting data.

### **Resources to be Purchased by Students:**

Getting to Know ArcGIS Desktop 10.8

Michael Law & Amy Collins

\*includes 180-day free trial of ArcGIS Desktop and data for completing exercises

### **Evaluation Process/Grading System:**

Exercises                      70%

Final Project                 30%

### **Exercises (70%):**

There will be 7 (10% each) exercises throughout the 13-module course to reinforce and demonstrate concept understanding and practical application.

### **Final Project (30%):**

There will be 1 final project that will consist of a final map product, technical report and short presentation for participants to demonstrate their cumulative learnings and ability to apply knowledge to a project/topic of their choice.

### **Course Objective:**

The objective of this 13-module course is to provide participants with the fundamental theories and concepts of Geographic Information Systems (GIS). Students will learn about data input, storage, and editing, spatial data structures, analytical functions of a GIS, data output, and the management and applications of GIS. The course includes both theoretical lectures and practical laboratory exercises, where students will gain hands-on experience with commercial GIS software, ArcGIS. By the end of the course, students will be able to:

1. **Be able to identify the usefulness of GIS applications in various industries** – define what a GIS is and does, understand data types and identify various industry use cases
2. **Be able to use the ArcMap interface effectively** – access and start the ArcMap software, open, save and share projects correctly, add layers, zoom-in/out, and navigate the user interface
3. **Be able to utilize and manipulate basic attribute table properties** – add/edit attribute data, perform a query, retrieve statistics, and perform a join/relate
4. **Manipulate and customize the symbology for feature classes within a layer** – change symbols for features in a layer, develop a legend, select appropriate data classifications
5. **Create a map layout** – manipulate layout properties, add components including the data frame, legend, scale bar, north arrow, title and labels
6. **Perform geoprocessing tasks** - be able to analyze spatial data, and utilize ArcToolbox to properly use the merge, dissolve, clip, union, erase, intersect and calculate areas tools to manipulate layers
7. **Integrating GIS with GPS and GPR Technologies** – be able to incorporate GPS and GPR datasets into ArcMap
8. **Project Management** – be able to source, develop, edit and store appropriate data types, develop project scopes and create deliverables geared to the audiences need

## Module Breakdown

### GETTING TO KNOW GIS

#### **Module 1: What is GIS and its applications**

- Define what a GIS is and does (include Indigenous lens)

#### **Module 2: Exploring ArcGIS (Software)**

- ArcMap, ArcCatalog, ArcPro, ArcGIS Online, licenses

#### **Getting started with Maps & Data**

#### **Module 3: Data Types & Interacting with Maps**

- Vectors, Rasters, & Attribute Data
- Display, Navigate, Map Scale and Basic Tools

#### **Module 4: Symbolizing Features and Rasters**

- Classifying Features
- Labelling

#### **Module 5: Map Creation**

- Cartography Elements
- Coordinate Systems and Map Projections

## **DATA ANALYSIS**

### **Module 6: Geodatabases & File Management**

- Create a Geodatabase/Feature Class

### **Module 7: Querying Data**

- Select and Find Features
- Attribute Queries
- Select by Location

### **Module 8: Joining and Relating Data**

- Join Data by Attribute, Relate Data and Join Data by Location

### **Module 9: Creating and Editing Features**

- Draw Features and Add Attributes
- Edit Features

### **Module 10: Geoprocessing Tools**

- Address Locators
- Clip, Buffer, Dissolve, etc.

## **PROJECT MANAGEMENT & INTEGRATION**

### **Module 11: Integration with GPS/GPR**

- GPS & GPR Overview and integration within GIS application

### **Module 12: Data Sourcing, OCAP Principles, Presenting Data**

- Open data sources, OCAP Principles and developing deliverables tailored to audience

### **Module 13: Final Project**

- Final Project Presentations